Jan. 24, 1933. J. MORTON 1,895,293

SUPPLYING FIBROUS MATERIAL FOR INCORPORATION INTO FABRICS

Filed Jan. 30, 1932 3 Sheets-Sheet 1

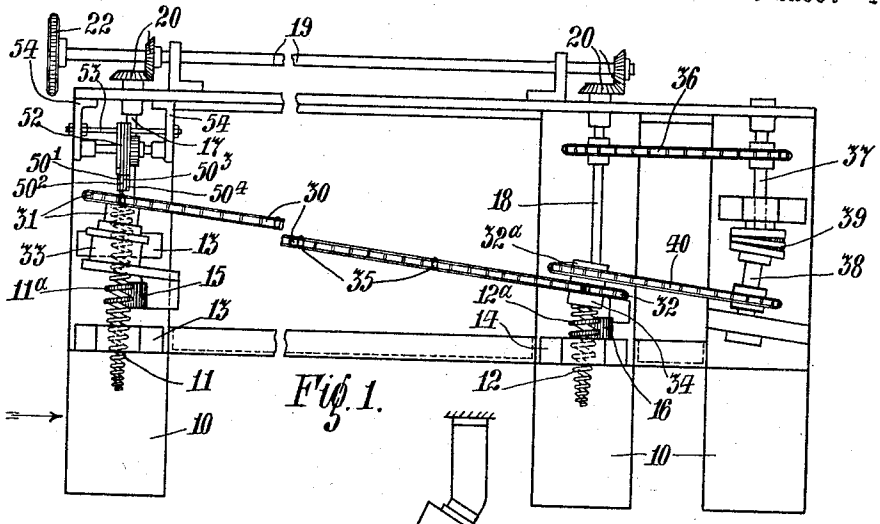

Fig. 1.

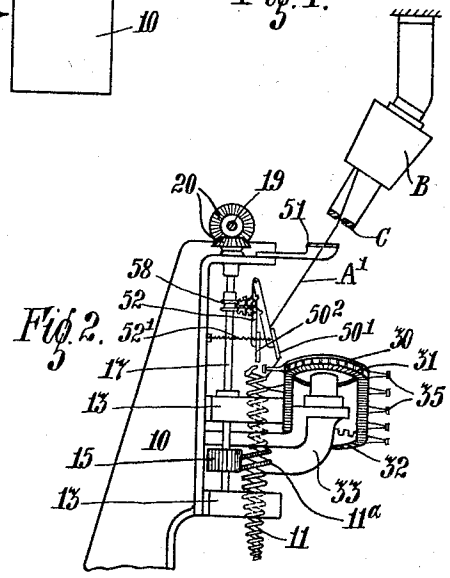

Fig. 2.

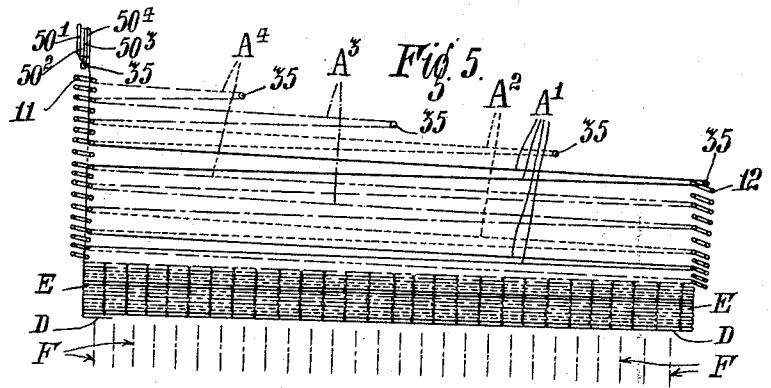

Fig. 5.

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Filed Jan. 30, 1932 3 Sheets-Sheet 2

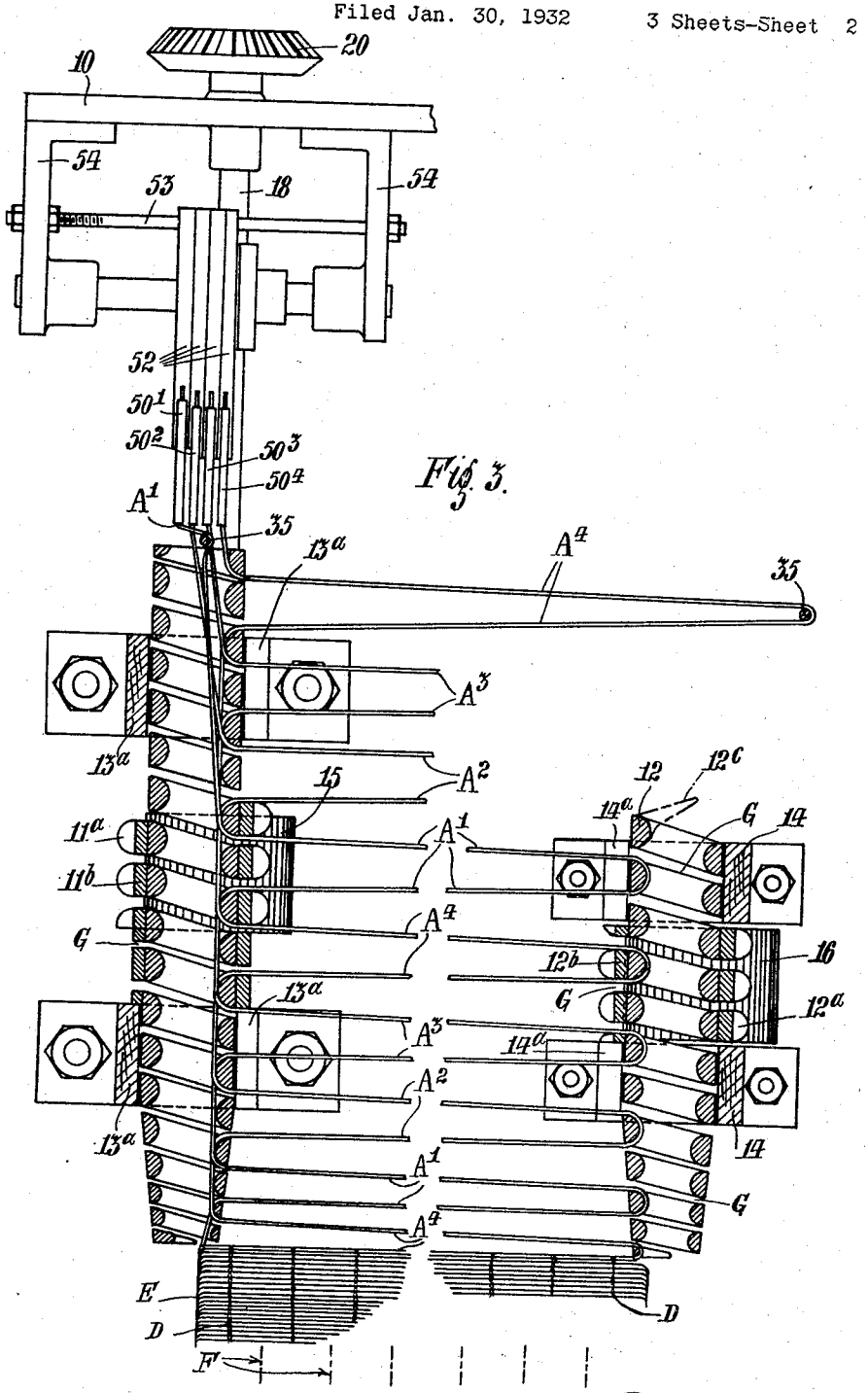

Fig. 3.

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SUPPLYING FIBROUS MATERIAL FOR INCORPORATION INTO FABRICS

Filed Jan. 30, 1932 3 Sheets-Sheet 3

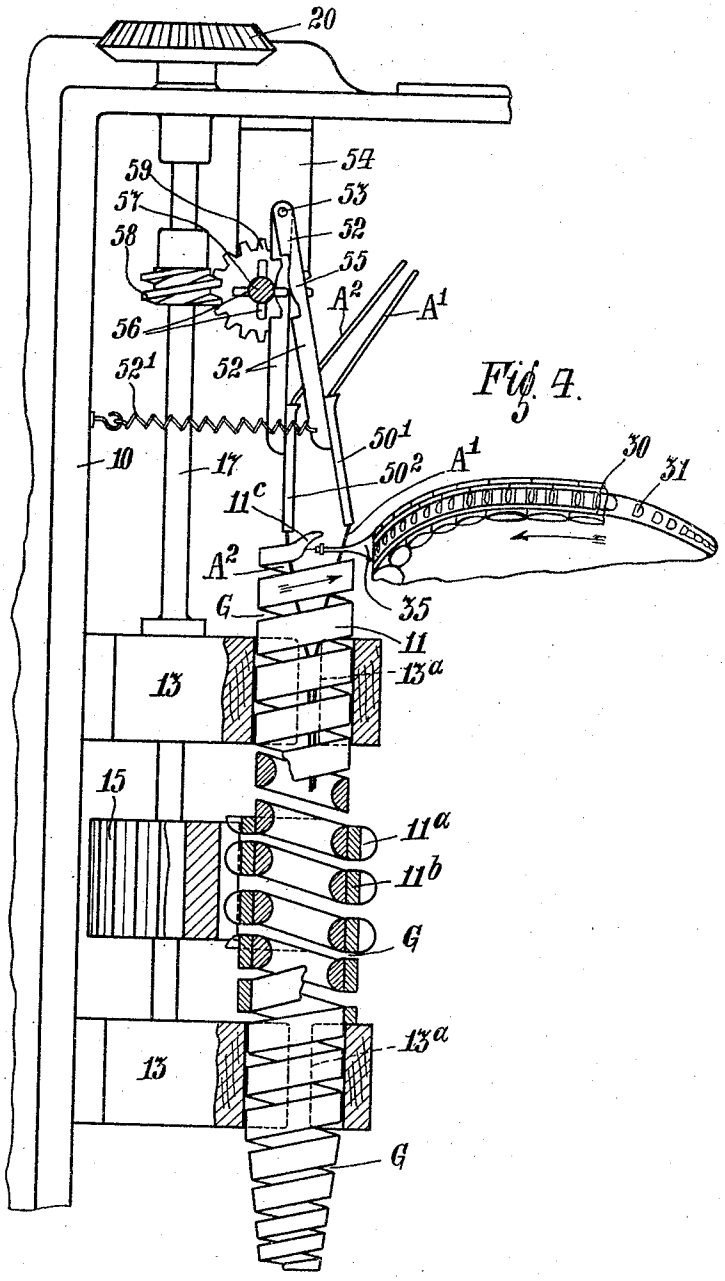

Fig. 4.

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UNITED STATES PATENT OFFICE

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SUPPLYING FIBROUS MATERIAL FOR INCORPORATION INTO FABRICS

Application filed January 30, 1932, Serial No. 589,828, and in Great Britain March 27, 1931.

This invention relates to supplying lengths of fibrous material in parallel or substantially parallel formation ready for incorporation in fabrics during the course of manufacture thereof. The term fibrous material is intended to include all kinds of threads, yarns, cords, tapes and even strips, such as strips of chenille.

The object of the invention is to provide a novel method of and means for bringing the fibrous material into the formation of parallel or substantially parallel lengths, and, while in this formation, rapidly feeding it forward, as successive lengths, ready for incorporation in the fabric during the course of manufacture.

According to the invention, the material is passed to the helical convolutions of rotary screw or equivalent feeding devices in such manner as to pass to-and-fro in lengths between the devices. As the devices rotate they automatically bring the material, fed from a source or sources of supply, into substantial parallelism and, at the same time, feed it forward, in lengths side-by-side and one after the other, to the place of discharge ready to be incorporated either directly or indirectly in the fabric being manufactured.

Material from one or more sources of supply may be formed into loops which are fed forward in substantially parallel formation to the place of discharge. The material may be presented to means which form the same into substantially parallel loops open at one end, the loops being fed forward by the helical convolutions of the rotary feeding devices.

The aforesaid means for forming the fibrous material into loops may comprise a travelling conveyor or any equivalent means, and the loop conveyor or equivalent may be formed with material-engaging projections or other devices.

The material may be supplied from one or more cones, cops, bobbins or other mountings on a stationary support, in which event the material can be led to, and placed in engagement with, the devices by travelling or other suitable guide means. This arrangement has the advantage that material can be continuously supplied without the necessity of stopping the devices and the fabric-producing mechanism in order to renew the supply.

There may be several cones, cops, bobbins or other mountings and in that event said mountings may supply material of the same or different colours.

Where the materials have different colours, they may be supplied in sequence at regular or other intervals so as to introduce colour changes, such as stripes or checks in the fabric.

The material-supply means, the devices and the fabric-producing mechanism are all operatively interconnected to work in timed relationship.

All the principal moving parts are preferably arranged, in order that they may work at a high speed, to receive a continuous motion, such as rotary or endless motion, as distinct from reciprocatory motion.

In a preferred construction according to the invention, the feeding devices comprise two helically shaped members (in appearance something like slightly open helical springs) which are rotated in unison, the fibrous material extending in substantially parallel lengths from member to member and passing along a helical passageway in each thereof, the material being supplied thereto by guide means adjacent one member and co-operating with means adapted to draw out the material in loops and supply these to the other member. Each feeding device consists of a continuous strip of metal bent or shaped so as to constitute a series of convolutions of helical formation and having a portion provided with external teeth whereby the device can be rotated.

In order that the invention can be clearly understood, the aforestated preferred construction will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a front elevation of the mechanism and Fig. 2 is an elevation looking in the direction of the arrow II in Fig. 1.

Figs. 3 and 4 respectively are sectional elevations corresponding to Figs. 3 and 4, but drawn to a larger scale.

Fig. 5 is a diagram serving to illustrate the

principle upon which the mechanism works.

The mechanism as illustrated is intended to supply pile yarns of different colours for incorporation in a preparatory fabric which can be ultimately cut into strips of chenille for use in the manufacture of chenille carpets and other chenille fabrics.

The working parts of the mechanism are mounted on a stationary frame of any suitable construction denoted by 10.

The feeding devices comprise two rotary helical members 11 and 12, which are preferably vertically arranged as shown and have an appearance somewhat like helical springs with closely spaced coils, a free helical passage G being left from end to end of each member. The members 11 and 12 respectively are journalled in bearings 13 and 14, which may be made of wood, such as lignum-vitæ, these bearings being secured to opposite ends of the frame 10 and formed with longitudinal slots 13^a and 14^a (see Fig. 3) for a purpose hereinafter described. The helical members 11 and 12 are respectively provided with portions 11^b and 12^b of greater external diameter than the convolutions themselves, the said portions being cut with gear teeth 11^a and 12^a which mesh with gear wheels 15 and 16 secured to vertical shafts 17 and 18, journalled at opposite ends of the frame 10 and driven at the same uniform speed and in the same direction by a horizontal driving shaft 19 through the intermediary of intermeshing bevel gear wheels 20. The portions 11^b and 12^b rest upon the lower bearings 13 and 14 which accordingly support the members 11 and 12. The shaft 19 can be rotated from any suitable external source; for example, it may have a chain wheel 22 adapted to be rotated by a chain drive.

It will be seen, particularly at Fig. 3, that the member 11 is hook-shaped at its upper end 11^c and is longer than the member 12 and that the bottom ends of both members are disposed in the same horizontal plane. The member 12 also has a hook-shaped upper end 12^c. It will also be seen that the members taper to a smaller diameter in the vicinity of their lower ends and also that the convolutions themselves become reduced in thickness.

With the two helical members there is associated an endless chain convevor disposed immediately in front of the helical members and extending at an inclination between their upper ends. The chain passes around two chain wheels 31 and 32 journalled at a corresponding inclination in bearings 33, 34 secured to opposite ends of the frame 10. The chain is provided with ten equi-spaced projections 35 which move along a path passing across the tops of both helical members. The chain 30 is driven from the vertical shaft 18 through the intermediary of the following means, namely:—a chain drive 36 extending between the shaft 18 and a vertical shaft 37; an inclined shaft 38 driven by the shaft 37 through a flexible coupling 39; and a chain drive 40 extending between the inclined shaft 38 and the nave 32^a of the chain-wheel 32. The time relationship between the movement of the chain and the rotation of the helical members is such that a projection 35 crosses the top of each member once during each two revolutions thereof.

Immediately above the member 11 four tubules 50^{1-4} are provided through which are guided four yarns A^{1-4}, these yarns being of different colours or other characteristics and being supplied from cones, one of which is denoted by B in Fig. 2, the yarns passing by way of any suitable guide arrangement C in the vicinity of the cones and guides 51 secured to the frame 10. The tubules are carried by little slats 52 which are pivotally attached at their top ends to a rod 53 supported by brackets 54 which depend from the frame 10. Each slat 52 has a rounded portion 55 which co-operates with one of four tappets 56 projecting radially from a shaft 57 journalled in the brackets 54, the slats 52 being pulled towards the shaft 57 by springs, one of which is shown at 52'. These tappets are equi-spaced angularly around the shaft 57 and they are also spaced apart axially along the shaft to such an extent that each tappet can move into register with one portion 55. Thus, in a complete revolution of the shaft 57, the four tubules are displaced in single succession towards the chain 30. This will be clear from Fig. 4, in which the tubule 50^1 is shown displaced in the manner described. The shaft 57 derives its rotation from the vertical shaft 17 through the intermediary of a worm reduction gear consisting of a worm 58 on the shaft 17 and a worm-wheel 59 on the shaft 57, the reduction ratio of the gear being 8 to 1. The time relationship between the rotation of the shaft 57 and the rotation of the member 11 is therefore such that one tubule is displaced as shown at Fig. 4, once during each two revolutions of each member.

The aforesaid chain wheel 22 would be driven from a rotary shaft (not shown) driving or forming a part of the fabric-producing mechanism in association with which the mechanism according to the present invention would work, and the timing would be such that the helical members each perform one revolution for each cycle of operations of the fabric-producing mechanism.

The modus operandi of the mechanism will now be described, reference being particularly directed to Fig. 5. As therein shown, the yarn A^1 is represented by a continuous full line, while the other three yarns A^2—A^4 are represented in dotted lines, and it is to be understood that each of these yarns adopts precisely the same form as the yarn A^1.

As one of the projections 35 on the endless chain 30 (Fig. 1) moves towards the top of the helical member 11, the tubule 50^1 is displaced and leads the yarn A^1 into the path of the said projection 35 (see Fig. 4). Accordingly, as the chain continues its movement, the projection engages the yarn A^1 (as shown at Fig. 4) and pulls it at a downward inclination towards the right of Figs. 1, 3 and 5 in an open loop. The formation of this loop can be at once seen by referring to the yarns A^2, A^3 and A^4 each of which is shown pulled into such a loop in Fig. 5. As the said projection 35 continues its movement with the yarn A^1 downwards to the right, the hook 11^c during the rotation of the member 11 moves around and above the yarn A^1, and conveys the open or left hand end of the loop downwards along the helical passageway G. The movement and inclination of the chain conveyor is such that the downward component of said movement has a speed substantially equal to the feeding speed of the helical members, the arrangement being therefore such that the closed end of the loop engaged by the projection 35 moves downwards at the same rate as the open end of the loop engaged by the member 11. Thus, the approximate parallelism of the loops is maintained. Eventually, the projection 35 pulls out the loop of yarn A^1 to such an extent that the loop moves into the path of the topmost end 12^c of the member 12, and during this period the member 11 has been feeding the open end of the loop downwards and maintaining the loop horizontal, as shown in full lines at Fig. 5. At this instant, the topmost convolution of the rotary member 12 enters into engagement with the loop and removes it from the projection 35. Thereafter, the loop of yarn A^1 is fed horizontally downwards by both members until it finally reaches the ends thereof simultaneously and is delivered in two successive parallel lengths.

During the conveyance of the loops from the top to the bottom of the helices, they pass freely along the helical passage G, and in their movement they pass the bearings 13 and 14 by way of the slots 13^a and 14^a provided for this purpose.

Precisely the same procedure as above described with respect to the tubule 50^1 and yarn A^1 is followed with respect to the tubules 50^{2-4} and the yarns A^{2-4}. As shown in Figs. 3 and 5, all the yarns are fed down the helical passageways G in substantially parallel formation, and as they approach the bottom of the members, they gradually become more closely spaced, on account of the gradually decreasing pitch and thickness of the convolutions. The yarns are all disposed in the vertical plane containing the axes of the two members 11 and 12, and the slots 13^a and 14^a are disposed in this plane also, so that the bearings 13 and 14 offer no obstruction to the downwardly moving yarns. In the passage of the yarns down the helical passageway G in the members 11 and 12, the yarns present the appearance of a downwardly moving web composed of a continuous sequence of groups of yarns, each group containing two lengths of the yarn A^1, followed by two lengths of the yarn A^2, then two lengths of the yarn A^3 and finally two lengths of the yarn A^4.

As the helical members are hollow throughout, the yarns can be fed right down from the tubules 50. These tubules are displaced, in the manner described, in any desired order to introduce one or other of the yarns to the projections on the conveyor chain for the purpose of being pulled into loops.

The mechanism shown is simple and is adapted to work with only four yarns A^1 to A^4, but if so desired more tubules and yarns could be employed, the feeding members being in that event increased in diameter.

The fabric-producing mechanism to which the yarns are fed as above described, in quick succession and in parallel formation, would be so timed with respect to the hereinbefore described mechanism that the yarns are acted upon by the fabric-producing mechanism instantaneously before the yarns are delivered by the members 11 and 12. Thus, the yarns are, for example, knitted or sewn into a fabric before they are actually delivered. Rows of knitted or sewn stitches D in a fabric E are shown in Figs. 3 and 5, the rows of stitches D being spaced comparatively widely apart. The fabric E is thus suitable for subsequent cutting along the lines indicated by F into strips of chenille, the tufts of the chenille consisting of portions cut from the originally supplied yarns A^{1-4}.

It will be manifest that the invention is applicable to the production of any fabric which requires the insertion of wefts or other cross threads at high speed, whether such fabrics are produced by weaving, knitting or sewing, or by lace or net machines, or whether the said fabrics are produced by binding fibrous material, supplied according to this invention, by means of adhesive binders. In the case of weaving, knitting, sewing, netting or lace mechanism, warps introduced to the mechanism are formed into successive open sheds, and the feed devices deliver the lengths of fibrous material into these sheds, which close and lock each length immediately before it is actually delivered In carpet or rug manufacture, the invention can be used for supplying lengths of chenille fur to the setting loom.

I claim:—

1. Means for supplying fibrous material in lengths, comprising feeding devices formed with material-receiving convolutions and having a hollow interior, means for leading

said material to the hollow interior of one of said devices so as to be engaged by the convolutions thereof, means for looping said material in lengths extending from the one to the other of said devices, and means for rotating said devices so that they feed said lengths to a place of discharge.

2. Means for supplying fibrous material in lengths, comprising feeding devices each consisting of helical convolutions, means for leading said material in lengths to said devices so as to pass around the convolutions thereof, and means for rotating said devices so that they feed said lengths to a place of discharge.

3. Means for supplying material in lengths, comprising two feeding devices formed with material-receiving convolutions, means for looping said material in lengths between said two devices so as to pass around the convolutions thereof, and means for rotating said devices so that they feed said lengths in substantially parallel formation to a place of discharge.

4. Means for supplying fibrous material in lengths, comprising two feeding devices each consisting of internally open convolutions, means for looping said material in lengths between said two devices so as to be engaged by the convolutions thereof, and means for rotating said devices so that they feed said lengths in substantially parallel formation to a place of discharge.

5. Means for supplying fibrous material in lengths for incorporation in a fabric, comprising a pair of helically formed feeding devices, means for leading said material into engagement with one of said devices, means for forming the engaged material into loops and leading said loops into engagement with the other of said devices, and means for rotating said devices so that they feed said loops in substantially parallel formation to a place of discharge.

6. Means for supplying fibrous material in lengths for incorporation in a fabric, comprising a pair of helically formed feeding devices, guide means adjacent one of said devices for leading said material into engagement therewith, a conveyor for drawing out the engaged material into loops and conveying said loops into engagement with the other of said devices, and means for rotating said devices so that they feed said loops in substantially parallel formation to a place of discharge.

7. Means for supplying fibrous material in lengths for incorporation in a fabric, comprising feeding devices which consist of material-receiving convolutions, means for leading said material in lengths to said devices so as to be engaged by the convolutions thereof, gear teeth formed on said convolutions, rotary gearing meshing with said gear teeth and being thereby adapted to rotate said devices so that the devices feed said lengths to a place of discharge.

8. Means for supplying fibrous material in lengths for incorporation in a fabric, comprising a pair of feeding devices which consist of helically formed convolutions, means for leading said material into engagement with the convolutions of one of said devices, means for forming the engaged material into loops and leading said loops into engagement with the convolutions of the other of said devices, gear teeth formed on said convolutions, rotary gearing meshing with said gear teeth and being thereby adapted to rotate said devices in unison so that they feed said loops in substantially parallel formation to a place of discharge.

9. Means for supplying fibrous material in lengths for incorporation in a fabric, comprising a pair of helically formed devices, each having a hollow interior, bearings for said devices, said bearings having slots, means for leading said material into the interior of one of said devices, means for forming the engaged material into loops and leading said loops from the one to the other of said devices, and means for rotating said devices in unison so that they feed said loops through said slots in substantially parallel formation to a place of discharge.

10. Means for supplying a number of separate fibrous materials for incorporation in fabrics, comprising helical members provided with gear teeth, gearing meshing with said teeth and serving to rotate the members, guides for leading the separate materials to one of said helical members, a selecting device for moving said guides, and a travelling conveyor extending between the helical members, said conveyor including material-engaging devices adapted to pull out the materials in loops when their guides are moved and to leave the loops in engagement with the other of said helical members, after which the loops are fed in succession along the helical members to a place of discharge.

11. Means for supplying a number of separate fibrous materials for incorporation in fabrics, comprising two parallel helical members of different lengths and provided with gear teeth, gearing meshing with said teeth and serving to rotate the members in unison, guides for leading the separate materials to the longer helical member, a selecting device for moving said guides, and a travelling conveyor extending between the helical members, said conveyor including material-engaging devices adapted to pull out the materials in loops when their guides are moved and leave the loops in engagement with the shorter helical member, after which the loops are fed in succession and in substantially parallel formation along the helical members to a place of discharge.

12. Means for supplying a number of sepa-

rate fibrous materials for incorporation in fabrics, comprising two parallel devices of different lengths, each device consisting of a series of convolutions and having a hollow interior, gear teeth formed externally on said convolutions, gearing meshing with said teeth and serving to rotate the devices in unison, guides for leading the separate materials into the hollow interior of the longer of the two devices, a selector for moving said guides, and a travelling conveyor extending between the two devices, said conveyor including material-engaging projections adapted to pull out the materials in loops when their guides are moved and leave the loops in engagement with the shorter of the two devices, after which the loops are fed in succession and in substantially parallel formation along the devices to a place of discharge.

13. Means for supplying a number of separate fibrous materials for incorporation in fabrics, comprising two helical members of different lengths and provided with gear teeth, bearings for said members, said bearings having slots, gearing meshing with said teeth and serving to rotate the members in unison about parallel axes, guides for leading the separate materials to the longer helical member, a selecting device for moving said guides, a conveyor extending at an inclination between the helical members, material-engaging projections on said conveyor, and means for moving said conveyor so that the projections thereon pull out the materials in loops when their guides are moved and leave the loops in engagement with the shorter helical member, after which the loops are fed in succession along the helical members and through said slots to a place of discharge, the arrangement being such that the conveyor's movement has a component in the direction of said axes substantially equal to the speed at which the loops are fed by the helical members.

14. In or for means for supplying lengths of fibrous material for incorporation in fabrics, a pair of hollow feeding devices each consisting of a continuous strip of metal formed to constitute a series of convolutions of helical formation and having a portion provided with external teeth whereby the device can be rotated.

15. In or for means for supplying lengths of fibrous material for incorporation in fabrics, a pair of hollow feeding devices each consisting of a continuous strip of metal formed to constitute a series of convolutions of helical formation, said convolutions having a portion provided with external teeth whereby the device can be rotated and having a material-engaging projection at one end.

16. Means for supplying successive lengths of fibrous material for incorporation in fabrics, said means including two hollow members consisting of helical coils providing continuous internally open passageways which narrow and converge towards their material-discharging ends, and means for rotating both members.

17. Means for supplying separate fibrous materials, comprising devices formed with material-receiving convolutions and having a hollow interior, guides for leading said materials to the hollow interior of one of said devices, a selector for moving said guides in turn into a position in which the respective materials can be engaged by the convolutions of the said one of the devices, means for looping said material in lengths extending from the one to the other of said devices, and means for rotating said devices so that they feed said lengths to a place of discharge.

18. Means for supplying separate fibrous materials for incorporation in fabrics, said means comprising devices formed with material-receiving convolutions and having a hollow interior, means for rotating said devices, guides for leading said material to the hollow interior of one of said devices, tappets co-operating with said guides, a shaft to which said tappets are secured, means for rotating said shaft at a reduced speed relative to the speed of rotation of the said devices, so that the tappets displace the guides in turn into a position in which the respective materials can be engaged by the convolutions of the said one of the devices, and means for looping said material in lengths extending from the one to the other of said devices, which thus serve to feed said lengths to a place of discharge.

19. Means for supplying successive lengths of fibrous material for incorporation in a fabric, comprising two material-feeding devices of different lengths and formed with material-receiving convolutions defining internally open passageways, said devices being mounted for rotation about parallel axes, bearings in which said devices are mounted, said bearings having slots, means for leading said material to the longer device so as to be engaged in the passageway thereof, an inclined conveyor for looping said material in lengths from the longer to the shorter of said devices, gear-teeth provided externally on said convolutions, gearing in mesh with said teeth for the purpose of rotating the devices in unison, whereby the material is fed in lengths by the devices along their passageways and in the direction of their axes, the material passing freely through said slots, and means for moving the conveyor at a speed so related to the feeding-speed of the devices that the lengths of the material are maintained substantially parallel.

20. Means for supplying several fibrous materials, comprising two material-feeding devices of different lengths and formed with material-receiving convolutions defining internally open passageways, said devices be-

ing mounted for rotation about parallel axes, bearings in which said devices are mounted, said bearings having slots, means for leading said materials to the longer device, means for selecting the materials for engagement in sequence by the convolutions of the longer device, an inclined conveyor for looping the selected materials in lengths from the longer to the shorter of said devices, convolutions of gear-teeth provided externally on the previously said convolutions, gearing in mesh with said teeth for the purpose of rotating the devices in unison, whereby the materials are fed in successive lengths by the devices along their passageway and in the direction of their axes, the materials passing freely through said slots, and means for moving the conveyor at a speed so related to the feeding-speed of the devices that the lengths of the materials are maintained substantially parallel.

21. Means for supplying several fibrous materials for incorporation in a fabric, comprising two material-feeding devices of different lengths and formed with material-receiving convolutions defining internally open passageways, said devices being mounted for rotation about parallel axes, bearings in which said devices are mounted, said bearings having slots, pivotal guides for leading the respective materials to the longer device, means for displacing said guides in a predetermined sequence so as to bring the materials in said sequence into position for engagement by the convolutions of the longer device, an inclined conveyor, projections thereon for engaging the selected materials and pulling them in lengths from the longer to the shorter of said devices, convolutions of gear-teeth provided externally on the previously said convolutions, gearing in mesh with said teeth for the purpose of rotating the devices in unison, whereby the materials are fed in successive lengths by the devices along their passageways and in the direction of their axes, the material passing freely through said slots, and means for moving the conveyor at a speed having a component in the direction of said axes substantially the same as the speed at which the lengths are fed.

22. Means for supplying successive lengths of fibrous material for incorporation in fabrics, comprising feeding devices formed with material-receiving convolutions and having a hollow interior, means for leading said material to the hollow interior of one of said devices so as to be engaged by the convolutions thereof, means for looping said material in lengths extending from the one to the other of said devices, bearing means for said feeding devices, slots in said bearing means for the free passage of said material, and an external portion on the convolutions of each device to rest upon said bearing means, the said portion being provided with external teeth whereby the device can be rotated.

In testimony whereof I affix my signature.

JAMES MORTON.